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WHY DO WORKERS WORK SAFELY? DEVELOPMENT OF SAFETY MOTIVATION QUESTIONNAIRE SCALES

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ABSTRACT

Background: Motivation is one of the most important factors for safety behaviour and for implementing change in general. However, theoretical and psychometric studies of safety performance traditionally treat safety motivation, safety compliance, and safety participation unidimensionally. Questionnaire items tap into occupational safety motivation in asking whether or not respondents are motivated, and whether they feel that safety is important or worthwhile, rather than what motivates workers to comply with safety regulations and participate in safety activities. The aim of this article is to introduce and validate new theory-based occupational safety motivation questionnaire scales.

Method: Seven occupational safety motivation questionnaire items are developed on the basis of a theoretical model with three forms of motivation for safety compliance/participation: normative, social, and calculated motivations. The items are tested using baseline measurements from a case-control safety intervention study with a total of 532 workers from 22 small, medium, and large metal or wood manufacturing enterprises. Mean scores for each item are ranked in size, and the scales/items are validated and matched with a questionnaire scale regarding safety compliance, as well as interview and observational data.

Results: Ranking patterns of the seven items are similar across all 22 enterprises, and six of the items fall into three factors: normative, calculative and social safety motivation. Workers are primarily motivated by normative safety motivations and only secondarily by social and calculated motivations. Questionnaire data, interview data, and observational data point to social motivations as being as important for safety compliance as normative safety motivations. There is a moderate, positive correlation between normative safety motivation and safety compliance and a weak but positive correlation between social motivation and safety compliance, but no correlation with calculative safety motivation.

Conclusion: Normative motivation and social motivation are important for workers safety behaviour, and are positively related to safety compliance. These findings can be used to improve safety in designing more effective safety interventions. Further development of occupational safety motivation scales should include calculative, normative, social as well as ethical motivation items.

Keywords: Safety compliance, safety participation, accident prevention, normative safety motivation, calculative safety motivation, social safety motivation.

INTRODUCTION

Motivation is identified as one of the most important factors directly or indirectly affecting safety behaviour and the success of safety interventions in general (1-6). It is included in well known models of accident prevention (3,7-9), and can also serve as a proactive outcome measure in safety interventions, as data on accidents and incidents are reactive measures often related with high uncertainty (10,11). Occupational safety motivation can be defined as "the individual factors which awaken, channelize and maintain behaviour to attain a curtain goal" (1,2) - in this case occupational safety behaviour. The definition is inspired by the original Latin verb 'movere', which means to move physically or emotionally, an internal state, or a condition (12). Furthermore, the definition emphasizes behaviour change and maintaining behaviour, which are important aspects of occupational safety interventions.

When examining work related motivation three overall groups of theories can be identified: (A) the early rational choice theory, (B) the 'need satisfaction' hierarchical theories, and (C) process theories. Within the process theories motivation is seen as more complex, involving the individual desire to change, with the expectation that this change will lead to improved performance, which again will lead to the desired reward influenced by skills and role perception (13-15). Rewards do not necessarily have to be identical with expected rewards, and the relationship between intention and control depends on the worker's ability to perform the intended behaviour, based on individual knowledge, training and/or personal skills (4,15). Based on the selected theory, safety behaviour and the possibilities for increasing compliance are viewed differently. Furthermore, the available options are based on external factors, for instance, whether the enterprise has the required safety equipment, and if it is easily accessible. Economic factors, legislation at the international, national and local level, enforcement of legislation, aspects of cultural, organizational and physical context, are also acknowledged as important factors in either short term or long term perspectives, although few models have included these (4).

Motivation is often categorized as either intrinsic or extrinsic, whereby intrinsic motivation refers to individual cognitive and psychological phenomena, while extrinsic motivation mostly refers to systems of rewards and punishment, e.g. material, financial and social rewards (12,14). The theoretical difference between intrinsic and extrinsic rewards is relevant within safety research. Compliance will often involve calculative, ethical, normative and/or social motivations or a combination of these, making different combinations of rewards important in each case. Hence, an improvement of motivation could require working with values and ideas at the individual and group level, as well as the safety climate (3). A relevant starting point in such an intervention is to analyse, why workers comply with or participate in safety activities.

There is very limited literature on measuring occupational safety motivation, and the term is still not conceptually clarified. Current safety performance research supports a differentiation between safety compliance and safety participation: Safety compliance deals with central and mandatory safety activities, e.g., the individual's use of personal protective equipment, whereas safety participation deals with voluntary safety activities related to the broader work environment, e.g., attending safety meetings (16). However, theoretical and psychometric studies of safety performance usually treat safety motivation, attitudes towards safety, safety compliance and safety participation unidimensionally, and ignore the theoretical and epistemological disagreements; for instance regarding how knowledge, attitude, and action are related (4,17). Other safety performance models view safety climate (individual perceptions of management policies, practices and procedures relating to safety) as influencing safety motivation, which in turn motivates safety compliance and safety participation (3,16,18). This leaves the status of safety motivation very unclear.

Many questionnaire scales have been developed that measure work motivation (19,20), safety culture and climate (18,21), safety compliance and safety participation (3,18), whereas safety motivation scales are scarce. A four-item occupational safety motivation scale has been used in a few studies (22,23) and was later revised and reduced to a three-item scale (16). These items tapped into the degree to which workers felt safety was important or worthwhile, e.g. "I feel that it is important to maintain safety at all times". The scale deals with one aspect of safety motivation – whether or not workers are motivated, and their attitude towards safety. Another aspect of importance is 'what motivates workers' or 'why workers are motivated to comply with and/or participate in safety'. This involves individual values about safety, including a normative, a social, and an ethical aspect. Here, ethic is defined as a "central motive" in the event-feature-emotion complexes that drive moral cognitive phenomena. As motivated cognition ethics are presumed to influence perception, information processing, goal setting, and affordances. When a worker treats a particular orientation as a normative imperative that surpasses other values, the orientation carries ethical significance (24). Individual values and ethics about safety are important, not just in our understanding of safety motivation, but also in order to incorporate it into the theory, design and content of safety interventions, and thereby increase their chances for success. The relationship between safety values and safety motivation has not been tested (9). However, while safety values are seen as

independent of context (9), safety motivation involves a situational judgement that may contradict with safety values. Furthermore, safety values are assumed to directly or indirectly influence safety behaviour, while safety motivation can be seen as directly causing safety behaviour, modifying the relationship between safety values and behaviour, and as an outcome of the intervention (5).

Based on a theoretical discussion in a study regarding motivation for compliance with environmental regulations Winter and May identify three forms of motivation for compliance: 1) normative, 2) social, and 3) calculative motivations (25). Normative safety motivations deal with civil and/or ideological issues, and internalization of these values is reflected in an intrinsic sense of duty towards safety activities. Social safety motivations (social-exchange theory are primarily extrinsic and based on perceived acceptance, approval of significant parties, whether they be co-workers, leaders, organizations, authorities or media, as these are seen as fundamental needs. Theories regarding calculated safety motivations have received the most attention in the scientific literature with roots dating back to the early rational choice theories (26), particularly in regards to calculated rewards and punishment (gains vs. losses, economics, injury, etc.), whereby the perceived benefits of compliance (or non-compliance) exceed the costs. However, these theoretical insights have not previously been introduced within occupational safety research.

The aim of this article is to introduce theoretically and empirically based occupational safety motivation questionnaire scales/items, which focus on why workers work safely. The scales/items are to be validated and matched with a questionnaire scale regarding safety compliance, interview data and workplace observations.

METHOD

Data in the current study are derived from a case-control pre-post occupational safety intervention study, in which data was collected though a large safety climate/culture questionnaire, semi-structured and focus group interviews, and safety observations. Data was collected from 22 enterprises: 16 small metal manufacturing enterprises, four medium sized metal manufacturing enterprise, and two large wood manufacturing enterprises (Table 1). The data used here are from the baseline measurements prior to the interventions.

Table 1. Descriptive data of sample of safety climate/culture questionnaire study in small, medium and large enterprises

Enterprise/firm size	Numbero f firms	Geographic location	Number of employees	Response rate
Small firms	16	Jutland (8) and Zealand (8)	10-20	80-90 %
Medium-sized firm	4	Jutland	30-40	91-94 %
Large firms	2	Jutland	110-130	92-95% %
Total	22		532	88 %

New items for identifying occupational safety motivation

Based on Winter's and May's (2001) theoretical discussion, and Narvaez' definition of ethical motivation defined as a sub-dimension of normative motivation, seven safety motivation questionnaire items were developed (Table 2). Normative motivation is measured in items 1, 2, 4, ethical motivation in item 6, social motivation in items 2 and 3, and calculated motivations in items 5 and 7. Normative and social motivation are as influential in enhancing compliance as calculative motivation, and the three motivation types can be complimentary and/or competing; depending on the context (25). Social motivations to perform safety activities (or not perform them) can lead to normative motivations and be reinforced by calculated motivations and vice-versa. For example, young and newly educated workers may have high ideals and a sense of moral duty (normative) towards performing safety activities when they enter the labour market, which may be challenged by completely different social and calculated motivations for non-compliance on the first day of work.

The seven safety motivation items focus on both intrinsic motivations (e.g. own values) and extrinsic motivations (e.g. rewards and punishment), whereas previous scales have dealt with either intrinsic (16) or extrinsic motivation (27). The extrinsic items deal with social interactions, whereas other scales have primarily focused on perceived workplace deficiencies that prevent respondents from behaving safely, e.g. lack of safety training, proper equipment, and safety checks (28). The response categorizes for the questionnaire items in this study range from *"Strongly agree"=1,"Agree"=2, "Disagree"=3* and *"Strongly disagree"=4*. The means of each of the seven motivation items are ranked in size.

Explorative factor analysis is carried out on the seven items using IBM SPSS Statistics 19 in providing values for Kaiser-Meyer-Olkin (KMO), total variance and Cronbach's Alpha. Based on the answers to the two or three items included in the identified scales, each worker subsequently obtains a score from 2-8 or 3-12 dependent of the number of items included in the scale. For simplification of the correlation analysis, each scale is divided into three categories - low/medium/high safety motivation (29) - with approximately 33 % of the cases in each category. Generally, missing values are handled with the 50 % rule, excluding cases which have answered less than 50 % of the items under the topic or in the scale. Furthermore, in construction of the scales the following replace-rule is also used: given a Cronbach's Alpha of min. 0.7, the remaining missing values have been replaced with the mean value of the answered items in the scale. Correlation between the safety motivation factors (scales) and safety compliance are tested using Gamma (29).

The safety compliance scale is inspired from three previous studies (30-32) and is further developed in the current study. The compliance scale consists of the following items: A) "By ignoring safety rules, the work sometimes flows better", B) "I take shortcuts which involve little or no risk", C) "Sometimes it is easier not to comply with the safety rules", and D): "I do not use safety equipment if I find it too inconvenient". The scale is validated in several Danish safety studies and is correlated to the incidence of injuries and accidences (31).

As safety activities are seen as more formal in larger enterprises, and often are mandatory, the introductory sentence for the seven motivation items (Table 2) in the large enterprises was formulated as: "Why do you actively take part in safety work?**"**, in which safety work is defined as taking part in compulsory safety activities such as tool-box meetings (leader lead group meetings for all employees regarding production, safety, etc.). In the medium and particularly the small enterprises, safety is in practice organised less formally, and safety issues are often dealt with ad hoc (33). Hence, the following phrase was used: "When you work safely, you do it because…".

The questionnaire data are matched with interview data and observational data collected throughout the intervention period, and primarily in the 11 intervention firms. The focus-group interviews were conducted with minimum two-four workers in each company or department, and they lasted 30-90 minutes. The focus-group interviews covered the following overall themes: 1) how safety is practised in the group or department, 2) safety compliance 3) safety participation, 4) safety motivation, 5) management involvement in safety, and 6) safety communication by management and among workers. The observational data are based on two-three hour monthly observations of the safety behaviour of the employees and working conditions carried out over a 1½ year period. The observations are semi-structured, covering the same themes as the interviews. However, when something unexpected or unusual happened, this was noted and included in the analyses. Despite that the intervention period was only six months in the small and medium sized firms, the same method was used in all the participating companies. In the analyses examples are mainly drawn from observations in the large firms.

RESULTS AND DISCUSSION

Ranking patterns of the seven items were similar across all 22 enterprises (Table 2), with item 4 ("Because safety work contributes to the prevention of accidents") and 1 ("Because it is a natural part of work") receiving the best and next best scores, respectively.

Table 2. Occupational safety motivation questionnaire item mean scores and rank.Score values from 1 (Strongly agree) to 4 (Strongly disagree).

		Item mean scores						
Enterprise/firm size	Replies	1	2	3	4	5	6	7
Small firms (*n*=8)*	74	1.66	1.93	2.65	1.42	2.66	2.18	2.76
Small firms (*n*=8)*	116	1.54	1.71	2.29	1.32	2.56	2.13	2.33
Medium-sized firms (*n=4*)*	125	1.64	1.98	2.59	1.57	2.60	2.10	2.44
Large firm A**	123	1.57	1.66	2.18	1.26	2.36	1.70	2.36
Large firm B**	94	1.76	2.02	2.33	1.39	2.72	1.95	2.76
All	**532**	1.62	1.85	2.39	1.39	2.56	2.00	2.49
		Item rank						
Small firms (*n*=8)*	74	2	3	5	1	6	4	7
Small firms (*n*=8)*	116	2	3	5	1	7	4	6
Medium-sized firms (*n=4*)*	125	2	3	6	1	7	4	5
Large firm A**	123	2	3	5	1	6	4	7
Large firm B**	94	2	4	5	1	6	3	7
All	**532**	2	3	5	1	7	4	6

* When you work safely, you do it…
** Why do you actively take part in safety work?

1. Because it is a natural part of work
2. Because it is expected of me
3. Because my colleagues do it
4. Because safety work contributes to the prevention of accidents
5. To avoid negative remarks from my leader/colleagues
6. Because I feel morally obligated to do so
7. Because you gain respect amongst your colleagues

The statistical and theoretical analyses categorised the seven items into three scales: A normative safety motivation scale consisting of items 1, 2 and 4 (KMO=0.632, $p<.001$, 56 % of the total variance explained, Cronbach's Alpha of 0.584); A calculative safety motivation scale with items 5 and 7 (KMO=0.5, $p<.001$, 77 % variance explained, Cronbach Alpha of 0.694); and finally, social motivation measured by item 3 (Table 3). There are both theoretical and statistical arguments for categorizing item 2 as a social motivation as there is no clear distinction between the influences of personal and others' expectations, especially if the group is highly cohesive (6). However, the statistical analyses give stronger support for inclusion of item 2 in the normative scale. Furthermore, there is statistical support for a combined calculative-social scale. By way of contrast, the theoretical

analyses suggest a separation of the items (3, 5 & 7), as they are two different types of motivations. As the main purpose of this paper is to test a theoretically based scale, these arguments are favoured here.

An inclusion of item 6 in the calculative scale increases the KMO value to 0.675 (p<.001) with 65 % variance explained. However, as described previously, theoretically and logically item 6 cannot be categorized as a calculative motivation. Furthermore, there are statistical arguments for the inclusion of item 6 in all three scales. As ethical motivation cannot be identified as a separate dimension, the item is excluded from further analysis in this paper.

Table 3. Summary of the factor analyze results

	KMO	P-value	Variance explained	Component matrix values	Cronbach Alpha
Normative scale (item 1,2,4)	0.632	P<.001	56 %	>0.617	0.584
Calculative scale (item 5,7)	0.500	P<.001	77 %	>0.854	0.694
Normative scale (item 1,2,4,6)	0.703	P<.001	50 %	>0.501	0.614
Calculative scale (item 5,6,7)	0.675	P<.001	65 %	>0.736	0.730
Calculative-social scale (item 3,5,7)	0.669	P<.001	65 %	>0.708	0.724
Social scale (item 2,3)	0.500	P<.001	70 %	>0.772	0.569

Given these scales and ranking patterns of the questionnaire items, workers were primarily motivated due to normative safety motivations (items 1,2, & 4), and only secondarily due to social (item 3) and calculated motivations (items 5 & 7). According to these results, prevention efforts should rather focus on increasing the workers' normative motivations, as these lay the basis for their active participation in safety work/working safely. The results reflect the findings in Winter and May's study (2001), showing that normative motivation dominates over calculative motivation. Moreover the result is supported by Sheeran and Silverman's findings showing that extrinsic motivation is insufficient in making nurses participate in compulsory health and safety training (34). These results, however, contradict findings in the scientific literature on calculated and extrinsic based motivation, which to a greater degree categorise safety work as a matter of balancing rewards and punishment.

Calculative and social safety motivation cannot be statistically differentiated, and the constructed scales do not fulfil the traditional statistical criteria of a KMO value of 0.7 and a Cronbach Alpha of 0.7. However, these criteria are not definite, and within social science lower values are often accepted (29)**.** As safety motivation is a relatively new and uncovered area within safety science, the analyses are continued with the limitations mentioned above.

The importance of each dimension is identified, based on a comparison of mean values using Annova. Generally, there are many similarities between the results from the small and the large enterprises, while the medium sized firms differ from the others on important aspects. Hence normative motivation is less important for the workers in medium sized firms (difference in mean values: 0.43, p<0.05). Moreover, social motivation has less importance for the workers in the medium sized enterprises than for the workers in large enterprises (difference in mean values: 0.35, p<0.05). Social motivation also seems to be more important for workers in the large firms than in the small firms, however this difference is not significant (difference in mean values: 0.16, p=0.24). Calculative reasons have equal importance in the small, medium sized and large enterprises. This result is interesting, as the physical distances between employees and managers generally are greater in large enterprises, making it more difficult for the managers to view and/or control/intervene in the safety behaviour of the workers. Yet, the result can be explained if safety compliance in the large enterprises, to a greater degree, is influenced by the co/workers, which the above results suggest.

Safety motivation and safety compliance scales

The factor analyse shows that the safety compliance scale has a KMO-value of 0.896 (p<0.001), 99 % variance explained, and a Cronbach Alpha of 0.975. The results of the correlation analyses of relationships between the two safety motivation scales, the social motivation item, and the safety compliance scale revealed a

moderate connection between normative safety motivation and safety compliance (Gamma value of 0.207; $p<.001$). Hence, workers with a high level of normative safety motivation, also comply to a larger degree with the safety rules. Furthermore, a weak, but positive connection between social safety motivation and safety compliance is also revealed (Gamma value of 0.135; $p<0.05$). According to these results, an increased level of normative motivation and social motivation may contribute to an increase in safety compliance and subsequently to a decrease in the number of incidents and accidents. The analyses also indicate a non-significant, weak, but negative connection between calculative motivation and safety compliance (Gamma -0.91; $p=0.144$). Even though the traditional statistical criteria are not fulfilled, this indicates that a focus on negative remarks and punishment may not be the best way to increase safety compliance. In the following, interviews and observational data are used to provide further detail and depth in expanding on the results.

Interview and observational data

The importance of normative reasons for participation in safety work is supported by data from the focus group interviews with workers in the small, medium and large enterprises. A worker from the large firm A said: "*Here, you just do it* (comply with the safety rules, red.). *In other enterprises you don't even talk about safety."* However, the interview and observational data from the enterprises across all enterprise sizes indicate that the attitudes and behaviours of colleagues are more important determinants for safety behaviour than the questionnaire data results indicate (e.g. Worker 3, 4, 5 Firm A and B; Manager 1, 2, and 3 Firm A and B). In all departments in the large enterprises, safety rules and safety practice are discussed on a regular and formal basis. The workers find these discussions as important for their safety behaviour as the attitude of their manager, e.g. "*We have to agree on the safety rules, and we also do. There is no doubt about that*" (Worker 1, Firm A). Another worker says: "*If I do not comply with the safety rules, my colleagues will tap me on the shoulder*" (Worker 2, Firm A).

Baarts' (35) study of group behaviour within the construction industry provides evidence on how worker behaviour is more highly influenced by individual and group norms than by the foremen. Furthermore, group norms can be especially important when there is great physical distance to the manager, and where employees have a high degree of shared values. The enterprises included in the current study all have either one or both of these characteristics. Furthermore, Ford and Tetrick (2008) point out that workers who identify themselves highly with the group or the company, will have an increasing desire to perform behaviours instrumental to group and/or organizational outcomes. This can, together with the possible differences between conscious and unconscious behaviour, explain the apparent contradictions between the questionnaire results and the interview and observational data. A blinded, randomized-control-trial (RCT) study (36) showed that workers, particularly new ones entering a group, unconsciously tend to increase their use of personal protection equipment if they see other workers do it. Observational data from the current study, collected over a 1½ year study period in firm A, revealed that workers in the different departments or teams acted collectively, when it came to the use/non-use of ear protection equipment. Hence, some work teams did not use them, and in other teams almost everyone did – and the differences could not be explained by characteristics of the tasks nor the employees. New employees quickly adapted to the praxis of their group, even if this was different from their previous behaviour. These results suggest that social motivation can be relevant for actual safety compliance, even if the workers are not aware of it.

Referring back to the three theoretical dimensions presented in the introduction, our questionnaire results show that normative motivation is the most important, followed by social motivation, and calculative motivation. Social motivation can either augment or counteract normative motivation; depending on the context. Our interview data and observations show an example of the first. Furthermore, social motivation and calculative motivation can be complementary as well as two different dimensions. Hence, the difference between intrinsic and extrinsic motivation rather seem to be analytical rather than definite, and based on these data it is not possible to estimate the importance of each. Lund and Aarø's (4) analyses of the KAP-model, which describes the connection between safety intervention, attitude, knowledge, action, and accident and injury rate, conclude that the model generally is weak, and that the connection between attitude and action is unclear. Hence, a focus on improving workers' attitudes towards safety will have limited effect on the accident rate. In this paper we suggest normative motivation as a new focus in occupational safety interventions, as this, across company size, not only is the most important reason why manufacturing workers work safely, it is also correlated with safety compliance.

In this paper the importance of ethical safety motivation, defined as a sub-dimension of normative motivation, has also been tested, and this turned out to be the fourth most important reason for workers to work safely. However, it has not been possible to uncover the ethics dimension sufficiently and identify it as a separate type of motivation. Hence, in further studies it is suggested to include one or two extra items in the questionnaire scale to uncover the ethics dimension. Furthermore, it is suggested to include the ethics dimension as an extra

dimension in Winter's and May's (2001) theoretical understanding of safety compliance. The new theoretical model for occupational safety compliance is presented in table 4.

Table 4. Theoretical dimensions of occupational safety compliance

Calculative	**Ethical**
Normative	**Social**

Limitations

Four major limitations of this study are: (A) the calculative scale does not live up to the traditional criteria of a KMO-value of 0.7 and Cronbach Alpha of 0.7, **(**B) correlations were not carried out with regards to safety participation, **(**C) social motivation is only measured by one item, and (D) ethical motivation is not sufficiently covered in the questionnaire. In future studies, both within and outside the metal/wood manufacturing industries, more social motivation and ethical motivation items should be developed and the possibilities for generalization of the results should be tested. Furthermore, to obtain full use of the scales in intervention studies, their ability to measure change must be tested.

Conclusions

Seven questionnaire items of metal/wood manufacturing workers' safety motivation have been developed. The results revealed similar ranking patterns in small, medium and large enterprises, Workers' had consistently more positive scores on the three normative safety motivation items, in comparison to the calculative motivation items and the social safety motivation item. Workers with a high level of normative safety motivation and social motivation also scored highly on safety compliance, while workers with a high level of calculative motivation tended to have a lower level of safety compliance. Furthermore, normative motivation has less importance for the behaviour of workers at medium sized enterprises than in small and large enterprises, and social motivation has more impact on the behaviour of workers in large enterprises than in medium sized enterprises. Interview and observational data revealed that social safety motivations play a decisive role in safety behaviour. Contradictory to the theoretical expectations, social motivation is more important for safety behaviour in large enterprises than in medium sized enterprises. Future interventions could include normative safety motivating aspects in the theory, design and content of their interventions, and use the existing social structures to support the programme. Moreover, motivation is complex and the inclusion of qualitative data can qualify the conclusions.

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